Tornado Damage Assessment Report

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Forest Service – Southern Region
May 2002

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Tornado Damage Assessment Report

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TO: Steve Koehn, State Forester

FROM: David Gailey, Southern Regional Forester

DATE: May 23, 2002

SUBJECT: Tornado Damage Assessment Report, Southern Region

Introduction

This report includes a woodland/urban interface damage assessment to the forest resources of Southern Maryland from a category four (4) strength tornado that hit Charles and Calvert Counties on April 28, 2002 at 7:10 PM. There were five fatalities from the storm. This report will address the urban interface damage, rural woodland damage assessment and fire hazard potential.

Forest Resource Assessment

The tornado touched down on land in the vicinity of Smallwood State Park in Western Charles County off of the Potomac River. Two structures were destroyed at the park. The funnel then lifted and landed in the Ripley area, north of Bicknell Road and began moving in a easterly direction towards La Plata and eventually crossed the Patuxent River at Benedict into Calvert County. The tornado path traveled approximately twenty four (24) miles across Charles with an average width of one thousand feet, encompassing 3206 acres. In Calvert County the tornado traveled approximately nine and one half miles (9.5) with an average width of 700 feet, encompassing 806 acres. Total area engulfed by the tornado is approximately 4012 acres.

Below is a summary of land use categories damaged by the tornado. These figures are for Charles County only and are estimates from field visits and map interpretation.

Land Use	Acres Damaged	Percent of Total Area
Forestland	1571	49 %
Agricultural land	513	16 %
Urban Interface	577	18 %
Urban/La Plata	545	17 %
	3206	100 %

Initially, emergency tree removal for access was the primary action for rescue missions and damage assessment. Intense tree/brush removal for clean -up did not get underway until Wednesday May 1, 2002. Two tree disposal sites were established by FEMA. One along Radio Station Road in La Plata and a second in King George County, Virginia, directly across the Harry S. Truman bridge. At one point of the tree debris removal it was estimated that 200 trucks a day were hauling a total of 1000 tons of debris to Virginia at a cost of $75,000.00 per day. As of this date approximately 240,000 tons of debris have been removed. Approximately 2000 tons of ash have been removed from the burning site in La Plata. FEMA is investigating the possibility of chipping some of the material; however, the extensive shattering of the woody material may preclude this operation.

The Maryland Forest Service, Charles County field office is very involved with sawlog salvage operations and tree trimming/removal consultation. The Forest Service has coordinated salvage operations with various forest product operators through out Charles and Calvert Counties. A list of Licensed Tree Experts and Forest Product operators has been posted on the Charles County Emergency Tornado Web Page, along with Forest Service contacts and telephone numbers. The Forest Service participated in briefing/planning meetings with the Charles County Commissioners.

The forestland damage is severe. Twenty five sites were visited in Charles and Calvert Counties to assess salvage potential. The path of the tornado destroyed all woodland it encountered. The woodland damage appeared to always involve mixed hardwood stands with sawtimber size trees (greater than 11.0 inches measured at chest height). Another observation was that the tornado almost always followed stream bottoms or low drainage areas once it crested on a high spot. Approximately seventy five percent of the trees in the woodland tracts were damaged, primarily the larger sawtimber size trees. There was an even distribution of trees with broken branches/ shattered boles and trees that were up-rooted and blown over. Salvage operations are viable, but time consuming and dangerous for the operator. Salvage values are averaging twenty five (25) to thirty three (33) percent of the original market value. Forestland in Charles County normally yields 7,000 to 9,000 board feet of lumber per acre, which equates to an economic value of approximately $1500.00 - $2500.00 per acre. Tree species composition, site productivity, tree size and access are variables that create the fluctuation in timber values.

Salvage operations are recommended and encouraged; however, the removal process is tedious. The Charles County Forestry office is coordinating a salvage initiative by assessing woodland and providing marketing assistance to landowners. The salvage operation will take approximately six months. Forest land left untreated will regenerate naturally. Future access into forest land for wildfire suppression efforts may be impacted by the tornado damage.

Urban Assessment

An urban tree damage assessment was conducted by the Southern Region Urban Forester in La Plata, which received the most structural damage. The Urban Damage Assessment report quickly shows that 75% of the areas surveyed were damaged. Broken branches, defoliation and loss of apical dominance were the primary areas of tree injuries. The Urban Damage Assessment report is attached.

A total of 1036 structures were damaged or destroyed. Below is a summary of the structure damage assessment:

	Single Family Homes	Mobile Homes	Apartments	Businesses	Public Buildings	Totals
Completely Destroyed	101	2	6	50	1	160
Major Damage	212	1	15	64	6	298
Minor Damage	477	0	11	84	6	578
Totals	790	3	32	198	13	1036

Tornado Damage/Hazards

The damage to the forest resources as a result of the tornado resulted in many forest management challenges.

- Economic loss to landowners due to the severe damage to commercial woodland
- Impeded access to woodland from blow down trees
- Economic loss of urban shade tree in communities
- Long term forest mortality because the unhealthy trees will be predisposed to damaging agents such as fungi and insects
- Increased hazards to urban and rural people due to debris hanging in trees and unstable root systems
- Increased brush fire hazard due to additional fuel loading

Severely Damaged Areas

End of Hunt Road
Thomas Stone National Historic Site
Clamber Hill
Hillendale Area
Quailwood
Town of La Plata
Ripley

Ellenwood
Clark's Run
Hawkins Gate Road
Zekiah Swamp
End of Grosstown Road
Jameson Manor
Walters Farm
Jameson Lake
Hughesville Manor
Homeland Drive
Scout Camp Road
Peach Tree Hollow
Indian Creek Estates
Indian Creek Wildlife Management Area
South Benedict

Forest Restoration Recommendations

- Establish PLANT Communities in neighborhoods with urban tree damage in order to encourage tree care and urban reforestation
- Assist the Town of La Plata and the County with developing a stump removal program for the urban communities and down town business area
- Secure funding for an Urban Tree Care program in order to treat damaged trees to promote healthy growth
- Develop a Street Tree Inventory in the Town of La Plata in order to prioritize tree care treatments and street tree replacement
- Increase the mulch production program at the Radio Station Road facility in order to utilize more wood
- Continue to assess woodland damage and coordinate salvage harvest operations
- Provide technical assistance and educational material/programs to the public in regards to proper tree care and maintenance
- Encourage large woodland tract owners to re-establish access to their woodland by opening woods roads closed from fallen trees
- Promote portable sawmill use in order to utilize damaged sawtimber for utility/barn lumber
- Promote site preparation and reforestation where applicable to re-establish high quality stands
- Monitor damaged trees and forests for decline symptoms from insects and disease infestation
- Minimize wildfire hazards by educating the public about safe debris burning procedures/regulations
- Salvage operations should be completed within six months in order to maximize log values before wood stain occurs from decay

WILDFIRE POTENTIAL ASSESSMENT

Ground surveys identified major areas of wind damage that ran in a fairly straight line from Pisgah in western Charles County to Saint Leonard in Calvert County. From a wild fire hazard perspective, the areas that were most severely impacted were the communities of: Pisgah, Ripley, Rose Hill Road, Valley Road, Morgan's Ridge, Clarks Run, Ellenwood Hawkins Gate Road, Grosstown, Burnt Store, Hughesville, Bucktown Road, Peach Tree Hollow, Prince Frederick Road at Indian Creek Estates, Benedict, Hallowing Point, Bowens, Boyds Farm and Saint Leonard.

The associated damage to structures and other improvements not withstanding, though the storm's path was extensive in terms of increased wildfire fuel loading, it was generally confined to a very narrow swath (< 400 yards).

FUEL HAZARDS

A very quick survey of the forest fuels in the tornado path show that no immediate increase in wildfire spread rates is expected. The affected area has produced large amounts of hanging / leaning large diameter fuels. A large quantity of the heavily damaged large stems will continue to remain green for one or more growing seasons, until they succumb to disease or insects. Those large diameter fuels that were broken and thrown to the forest floor will take three or four months to dry to a level that they will contribute to a fire's intensity. Most of the affected fuels were larger diameter hardwoods. Very little conifer damage was detected in the road survey.

After the October leaf fall, the forest fuel conditions will become more of a contributing factor in wildfire behavior. Most of the affected area will have changed from a fuel model 8 / 9 to a fuel model 10 / 11. The fire spread rates will have a marginal gain. However, the fire intensity will nearly double in the affected area.

Increased flame lengths in the fuel model 10 areas will require the use of more chainsaw teams and dozers for indirect fire suppression tactics. There will be an increase in some torching where aerial fuels have been lowered by bent and broken stems. Increased spotting will be associated with the torching.

HAZARDS TO FIREFIGHTERS

The number one increase in hazards to firefighters working in the storm path will be from standing snags. Dead snags easily carry fire to their tops, producing burning brands that can be transported long distances by the wind to start new spot fires. Firefighters will need to exercise extreme caution while cutting dead snags. Tree tops will be broken and hanging dangerously overhead of unsuspecting firefighters.

Bent, leaning and broken snags will need to be cut ahead of lighter tractor/plows and brush trucks. Many of those leaning, bent trees will be under tremendous pressure, causing a chainsaw hazard known as "spring poles". Spring poles are extremely hazardous to woodcutters who are not trained in their careful removal.

WILDLAND/URBAN INTERFACE PROBLEMS

Increased fuel loads around structures and other improvements can hamper suppression efforts for firefighters. Any remaining aerial fuels that would burn within close proximity to structures have the potential to send burning embers aloft. Drifting embers are a source of roof and attic fires.

Many of the existing woods roads and farm lanes are now hopelessly blocked by fallen trees. Fires that get started in areas that are blocked by fallen trees will have the potential to grow in size while firefighters cut their way through the roadblocks.

FIRE MANAGEMENT RECOMMENDATIONS

"DEFENSIBLE SPACE":

The cleanup efforts so far have been tremendous. However, there is major work yet to accomplish, especially in the more rural areas of the county. Every home owner who was affected by the storm damage should continue to create a defensible space around their structures and other improvements. A defensible space is an area that has been cleared of flammable materials a distance of 30 feet. This is the average distance that's needed to keep a fire from spreading from forest fuels to structures.

Road crews should continue to cut and chip fuels within 30 feet of roadways. Should a fire start, roadways are relied upon as positive fire breaks and anchor points for building fire lines.

FIRE SUPPRESSION TACTICS:

Fires that start in or burn into the cured storm damaged areas will require more indirect tactics, including dozer and/or tractor/plow lines. The lighter Type-5&6 tractor/plow units will be hampered by large amount of fallen large diameter trees and snags. Line construction rates will be less than 10 chains per hour, unless saw teams are sent out ahead of dozers. All tractor/plow operations will require a Line Locator / Dozer Boss, a Saw Team, and an experienced Dozer Operator.

Night time operations should be strongly discouraged within the storm damaged area because of the hazards of unseen spring poles and broken snags.

RESOURCE PRE-POSITIONING:

Tractor/plow units have already been pre-positioned around the most heavily affected areas. A JD-450-H Tractor/Plow is stationed at the Tenth District VFD in Pisgah. There is also a JD-350 Tractor/Plow unit currently pre-positioned at the Bel Alton VFD. That unit will be up-graded to a heavier JD-450 sized machine when a new one arrives this summer. Volunteer dozer operators have been trained at both fire companies to expedite transport of those units to a fire in the affected area.

WATER RESOURCES :

The Maryland DNR-Forest Service and the Southern Maryland Resource Conservation and Development Coordinator have jointly been working to locate dry fire hydrants in areas that will adequately support fire suppression water supplies. That work will continue, with new locations being directed towards the most severely impacted areas.

TRAINING :

Additional volunteer dozer operators will be trained to operate the dozers and transports that are pre-positioned in Bel Alton and Pisgah. A chainsaw class, should be scheduled jointly between the DNR-Forest Service and the Maryland Fire & Rescue Institute, for local VFDs.

RESULTS OF URBAN TORNADO DAMAGE ASSESSMENT
IN CHARLES COUNTY, SOUTHERN MARYLAND

The Urban Tornado Damage Assessment focused primarily on the Town of La Plata where most of the damage, in the urban context, occurred. The assessment was facilitated by a visit to each distinct site; that is, each area that appeared to be isolated from other sites (not contiguous) in so far as tree damage was concerned, within the urban limits. The procedure involved making an ocular estimate of the damage, mainly from the public right-of-way. Table 1 shows a summary of the damage procedures observed, while Table 2 shows a summary of the results of the actual damage assessment. For each damage type, the estimates are shown in 10 percent classes. Appendix I-Figures 1 to 13 contains a series of photographs that show some of the damages observed. The caption of each photograph also shows the map coordinates and, where possible, a more specific location where the photograph was taken. Appendix II shows a section of the DOQQ coverage of La Plata with the areas of damage denoted by the numbered polygons [See ADC Map 17, page 21].

Table 1. Summary of the Damage Procedures Observed.

1. For each location, draw 'representative polygons' (Estimate point coordinates of boundaries on map in relation to the actual position on the ground).

2. For each polygon, estimate percent (%) of area damaged in terms of the following ranges:

   1 = 0 - 25%, 2 = >25 - 50%, 3 = >50 - 75%, 4 = >75 - 100%

Damage Types Assessed

Uprooting of Trees	Cracks and Seams	Defoliation
Broken Boles	Broken Branches	Loss of Apical Dominance

Table 2. Summary Results of the Actual Damage Assessment.

Polygon No.	% of Area Damaged Code	Percent (%) of Trees With Each Damage Type					
		Uprooting Apical	Broken Boles	Cracks and Seams	Broken Branches	Defoliation	Loss of Dominance
1	3	10-20%	0-10%	0 – 10%	50-60%	20-30%	10-20%
2	4	0–10%	20-30%	0 – 10%	90-100%	70-80%	50-60%
3	4	20–30%	0-10%	0 – 10%	90-100%	90-100%	40-50%
4	4	10-20%	30-40%	0 – 10%	50-60%	70-80%	30-40%
5	2	0-10%	0-10%	0 – 10%	35-40%	10-20%	10-20%
6	4	10-20%	20-30%	0 – 10%	90-100%	60-70%	30-40%
7	3	0-10%	20-30%	0 – 10%	50-60%	40-50%	20-30%

Tornado Path

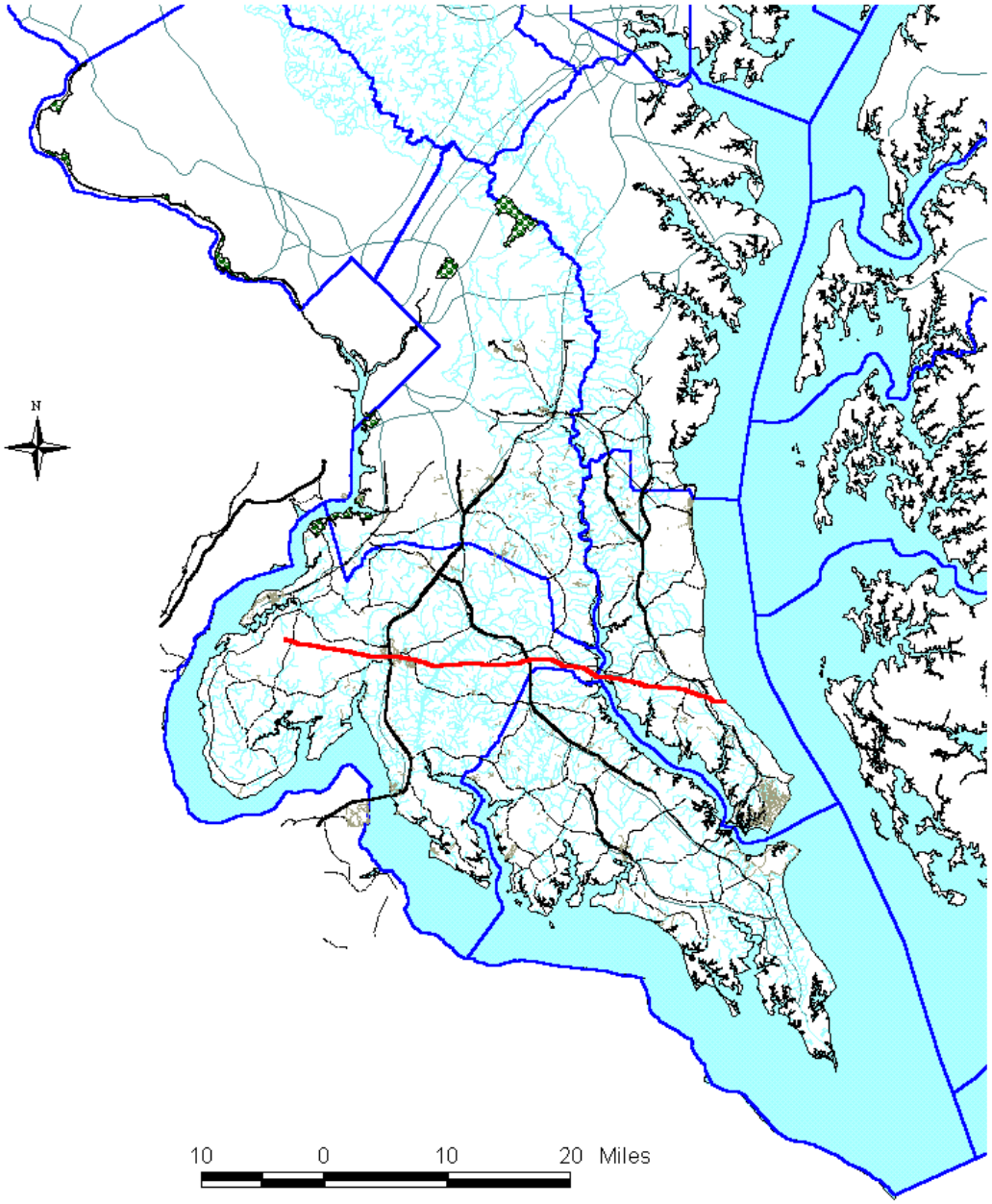

Figure 1. Complete Loss of Apical Dominance. [Polygon #1; E6, Baltimore Street]

Figure 2. Extreme Tree Damage to Roots, Boles and Branches.
[Polygon #2; E6-E7, Howard]

Figure 3. Widespread Tree Damage (Polygon #2; E6 – E7, Howard)

Figure 4. Completely Uprooted Trees. [Polygon 3; E7, Centennial Street Area]

Figure 5. Complete Defoliation, Broken Branches, etc. [Polygon #4; D6, Near La Plata Shopping Center]

Figure 6. Broken Boles and Loss of Apical Dominance. [Polygon #4; D6, Near La Plata Shopping Center]

Figure 7. Broken Branches. [Polygon #5; D6, Charles County Gov't. Blds.]

Figure 8. Massive Crown Damage to Trees. [Polygon #6; F7, Oak Avenue]

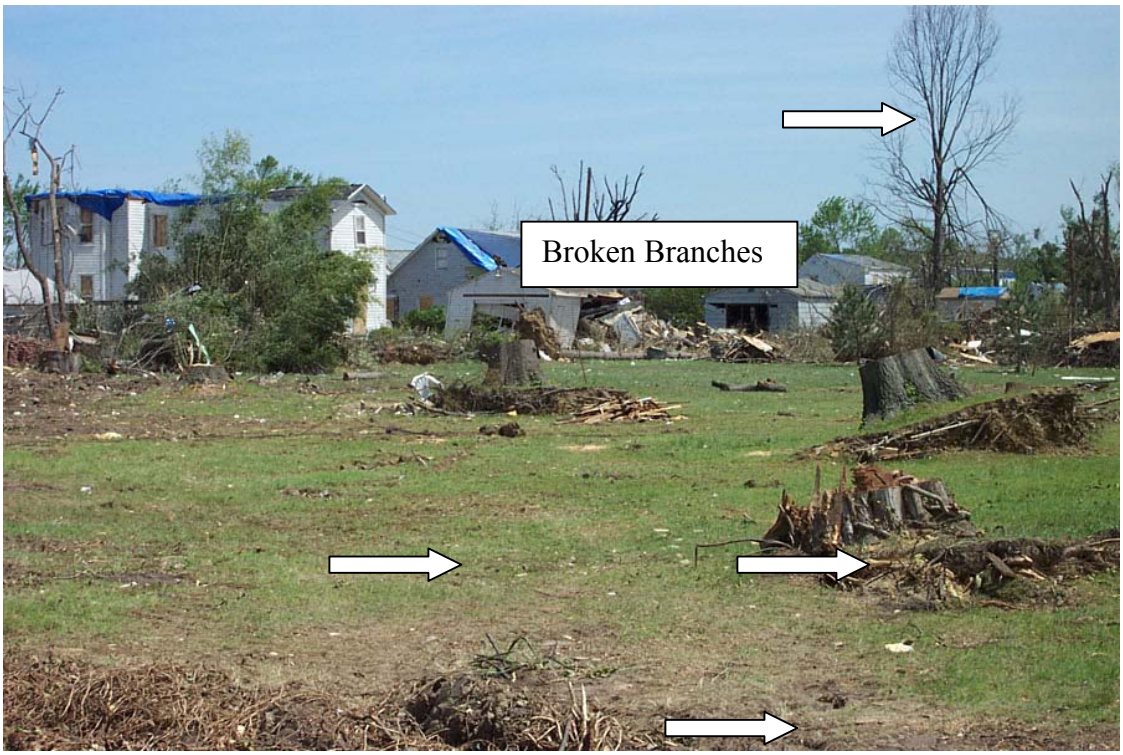

Figure 9. Partial Uprooting and Subsequent Felling of Trees. [Polygon # 6; F7, Oak Avenue].

Figure 10. Roadside Trees Removed. [Polygon #6; F7, Worcester Street]

Figure 11. Broken Boles – Trees Subsequently Cut. [Polygon #7; C6, Quailwood]

Figure 12. Loss of Branches, Broken Boles, Defoliation, etc. [Polygon #7; C6, Quailwood]

Figure 13. Panoramic View of Tornado Damage. [E7, Centennial Street Area.]

Figure 14. Tornado Damage From NOAA Satellite